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ABSTRACT

The purpose of this study was to assess the effects of adjunct objectives (AO) or adjunct rules (AR) on instructional materials. The subjects were 110 undergraduate volunteers attending Arizona State University. As each subject entered the lecture hall for the class, he was given an envelope containing the experimental materials appropriate to a group. The experimental materials were fourteen paragraphs taken from a basic text on historical geology dealing with the evolution of plants. Five to seven, five-alternative multiple-choice questions were constructed to assess specific factual information within each paragraph. An objective and rule were constructed for each test question. Objectives specified critical posttest attributes, while the rules were true statements which specified appropriate terminal responses. Objectives and rules were either placed before the paragraphs or after them. Half of the subjects received the adjunct items all massed together, and half received them distributed before or after each paragraph. Some of the results indicated that passage content was learned better by subjects given either a rule or an objective, and that placing objectives or rules before rather than after the passage decreased the time to read the passage. (WR)

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THE INFLUENCE OF ADJUNCT RULES AND OBJECTIVES ON LEARNING FROM TEXT MATERIAL[1]

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Objectives. Directing a learner's attention to the relevant attributes of instructional text is an often difficult task. Research with prose indicates that the placing of interrogative statements before or after a passage yields a predictable specification of what will be retained by the reader (Rothkopf, 1966, 1969; Frase, 1968, 1970). When questions are placed before a passage they act to influence the learning of material directly (critical) to their content, whereas questions given after reading tend to increase the likelihood of recalling both critical material *and* content not related (incidental) to the questions themselves. An important issue for instructional practice is whether or not this same predictable control is possible using specific instructional facilitators such as instructional objectives or rule statements. Research on these variables is confusing. Several studies have found specific performance increases when objectives are used in an adjunct manner (*e.g.*, Allison, 1969; Rothkopf & Kaplan, 1972). However, there is research suggesting that adjunct objectives (AO) may fail to effectively increase learning (Jenkins & Deno, 1971; Stedman, 1971). Whatever the reason for these opposing results, data is needed which clarifies the use of objectives as an orienting stimulus during instruction. Similarly, work with adjunct rules (AR) provides equivocal recommendations for instruction (Haslerud & Meyers, 1958; Wittrock, 1963; Wittrock & Twelker, 1964). Unlike the research on adjunct questions, few studies have attempted to systematically assess the effects of AO or AR on instructional materials. The present study attempts to clarify the role of these adjunct items. We reasoned that placing either AO or AR before a passage should increase specific attending behaviors to text material directly relevant to the stimuli, whereas placing the adjunct items after text should promote more diffuse inspection behaviors. Additionally, the type of adjunct item (objective or rule) should have a differential effect on what is learned. In our view, rule statements appear to be more content specific than their objective counterparts. Hence, we would predict an interaction between the type of adjunct item and type of item recalled, with learners who received rules performing best on critical material, and learners who were given objectives doing better on incidental recall. Finally, since frequency of questions facilitates learning (Frase, 1968b), we reasoned that distributing either the AO or AR throughout the text rather than

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massing them should lead to higher recall because of the increase in distributive frequency of encountering the adjunct items.

Method. Two variables, Text Position (T) and Distribution (D), were combined factorially to form four experimental groups. Both the type of adjunct item (OR) and the material tested (CI) were treated as Within-subjects variables for each factorial cell. The design was, thus, a 2 T (before X after) X 2 D (massed X distributed) X 2 OR (objectives X rules) X 2 C (critical X incidental test item) mixed analysis of variance, with repeated measures on the OR and CI factors.

The subjects were 110 undergraduate volunteers attending Arizona State University. As each *S* entered the lecture hall for the class, he was given an envelope containing the experimental materials appropriate to a group. Envelopes from each treatment condition were randomly ordered within blocks of four prior to distribution.

The experimental materials were 14 paragraphs taken from a basic text on historical geology dealing with the evolution of plants. The paragraphs averaged 150 words in length and were classified as "difficult" by the revised Flesh Reading Ease formula (Klare, 1963). Five to seven, five-alternative multiple-choice test questions were constructed to assess specific "factual" information within each paragraph. An objective and rule were constructed for each test question. Objectives specified critical posttest attributes, while the rules were true statements which specified appropriate terminal responses. Correspondence between test items, objectives and rule statements was validated in a pilot study prior to the main experiment. Based on the results of this validation, two test items were selected for each paragraph. The materials, then, consisted of the validated test items and their associated rules and objectives. Each learner's experimental booklet consisted of the 14 paragraphs and either a rule or objective associated with it. Objectives and rules were either placed before the paragraphs or after them in the booklets. Half of the subjects in each of these groups received the adjunct items all massed together, and half received items distributed before or after each paragraph. A control group of 22 learners read the material but did not receive adjunct items.

During the experimental session, learners were given an envelope containing the experimental materials and were told to read them carefully at their "normal" rate. Learners were cautioned not to review material once it had been read. The reading time for every paragraph was recorded by each subject to the nearest five seconds from a visible time board. When he had finished reading the material, the learner raised his hand and received the posttest. The test for all *S*s contained both critical (relevant to the adjunct items) and incidental (not directly relevant to the adjunct items) questions. Which of the two possible items a learner received for a given paragraph was separately randomized for each booklet.

Results. Initially, a 2 T by 2 D by 2 OR by 2 CI mixed analysis of variance on criterion test scores was computed for the experimental groups. This analysis yielded significance for the OR and CI main effects ($p < .01$) and for the OR X CI interaction ($p < .01$). No other terms reached significance. A 2 T by 2 D by 2 OR

analysis of variance was then calculated on paragraph reading times. The only factor reaching significance in this analysis was the T X D interaction ($p < .05$).

Discussion. The results of this study are in partial support of our hypotheses. Providing *Ss* with rule statements before or after reading related passages of prose produces significantly more learning than providing them with objectives. While the rule-objective pair referred to the same critical information within each passage, the information available to *S* during the reading of each adjunct item was not the same. Rules were statements which provided the *S* with answers to related test questions. Thus, the rule statement can be viewed as making available to the *S* an additional practice trial over the critical material read in each prose passage for which a rule was supplied in much the same fashion as does providing feedback prior to testing (Kulhavy & Anderson, 1972). In contrast, the rule-related objective for the same test question expressed a precise statement of the behavior the *S* was to acquire as a result of his reading. Only by reading the objective-related passage could he learn the critical information needed to answer the test question. This suggests that the objective served as a cueing device which focused the *S*'s attention on the critical passage content, rather than providing him with additional practice. Had rule statements been constructed to include a wider range of stimulus responses within a particular concept (Scandura, 1972), differences in rule-objective learning effects may have been quite different.

Passage content for which *Ss* were given either a rule or an objective (critical material) was learned better than information for which these adjunct items were withheld (incidental material). Although critical material was recalled significantly better on the posttest, adjunct items failed to interact with text position (T) or distribution mode (D) variables. This finding suggests that providing the learner with statements of rules or objectives during instruction enables him to focus his attention on acquiring relevant behaviors during his reading and to limit his inspection of less relevant material. Thus, it appears that the well established incidental learning effects of post-presentation may be modified when adjunct items are directly relevant to instruction.

In addition, our data indicate that placing objectives or rules before rather than after each related prose passage significantly decreased the time needed to read a particular passage. This finding is consistent with the results of Morasky and Wilcox (1970) who analyzed the effects of time as a function of question placement, either before or after prose passages. According to the mathemagenic hypothesis, question placement will result in differences in learner's attentional behaviors. Differences in time required by the Before-After adjunct item position groups for processing paragraphs suggests that differences may exist in the quality of the attentional behaviors manifest by each group during reading. The reliability of this effect is supported by our results. No significant differences occurred in paragraph reading times for either rules or objectives.

TABLE 1

Recall

Adjunct Item		Material	
		Critical	Incidental
Rules	X	3.67	2.95
	SD	1.70	1.45
Objectives	X	2.92	2.95
	SD	1.50	1.52

Time

Text Position		Distribution Mode	
		Massed	Distributed
Before	$\bar{X}$ min.	5.72	5.33
	SD	1.65	1.34
After	$\bar{X}$ min.	5.56	6.57
	SD	1.03	2.02